AMENDMENTS TO THE CLAIMS:

This listing of claims will replace all prior versions, and listings, of claims in the application:

1. (CANCELLED)

2. (Currently Amended) The apparatus of claim ~~1~~8, wherein the time of arrival and the channel coefficient are essentially concurrently determined by the joint searcher and channel estimator.

3. (Original) The apparatus of claim 2, wherein the time channel coefficient is a composite channel coefficient which takes into consideration channel impulse responses for channels associated with each of the plural antennas in the antenna array.

4. (Currently Amended) The apparatus of claim ~~1~~8, further comprising a detector ~~which~~ configured to utilize~~s~~ the channel coefficient and the time of arrival to provide a symbol estimate.

5. (Currently Amended) The apparatus of claim ~~1~~8, wherein the wireless communication receiver is a mobile terminal.

6. (Currently Amended) The apparatus of claim ~~1~~8, wherein the wireless communication receiver is a network node.

7. (CANCELLED)

8. (Currently Amended) A wireless communication receiver comprising:

an antenna array comprising plural antennas which provide respective plural series of signals for successive sets of pilot data;

a joint searcher and channel estimator configured to essentially concurrently consider the plural series of signals for determining both a time of arrival and channel coefficient~~The apparatus of claim 7,~~;

wherein each of the plural antennas in the antenna array is represented by an antenna index, wherein each of the sets of pilot data is represented by a pilot set index, and wherein the joint searcher and channel estimator comprises:

an antenna signal matrix in which a complex value indicative of a signal received in a sampling window is stored as a function of a sampling window time index, the antenna index, and the pilot set index;

a correlator configured to perform a Fast Fourier Transformation (FFT) calculation to generate a correlator output;

an analyzer configured to use the correlator output to generate the time of arrival and the channel coefficient;

wherein in performing the calculation the correlator is configured to consider~~s~~ plural possible frequencies of complex values along the antenna index and plural possible frequencies of complex values along the pilot set index, plural possible frequencies of complex values along the antenna index corresponding to plural possible directions of arrival and being represented by a frequency index n_1, the plural possible frequencies of complex values along the antenna index corresponding to plural possible doppler shifts and being represented by a frequency index n_2, and wherein for each combination of plural possible direction of arrival frequencies, plural possible doppler frequencies, and plural time indexes, the correlator is configured to calculate~~s~~:

$Y(n_1,n_2,t) = FFT(n_1,n_2,X(:,:,t))$

wherein t is the sampling window time index; X(:,t) is the complex antenna matrix (with the colon ":" representing all antenna indexes for one sampling window time index).

9. (Original) The apparatus of claim 8, wherein for each combination of plural possible frequencies and plural time indexes, the method comprises evaluating the following expression:

$Y(n,t) = \Sigma\ C_j$ *FFT(n,X(:,:,t)), j = 1,K

wherein C_j is a coding sequence symbol value j and K is the length of the coding sequence.

10. (Original) The apparatus of 8, wherein the correlator output comprises $Y(n_1,n_2,t)$, and wherein the analyzer determines a maximum absolute value $|Y(n_1,n_2,t)|_{max}$, wherein the analyzer uses a sampling window time index t_max at which $|Y(n_1,n_2,t)|_{max}$ occurs to determine the time of arrival of an arriving wavefront; wherein the analyzer uses the a direction of arrival frequency index n_1_max at which $|Y(n_1,n_2,t)|_{max}$ occurs to determine the doppler shift direction; and wherein the analyzer uses the a doppler frequency index n_2_max at which $|Y(n_1,n_2,t)|_{max}$ occurs to determine the doppler shift direction.

11. (Original) The apparatus of 8, wherein the correlator output comprises $Y(n_1,n_2,t)$, and wherein the analyzer determines a maximum absolute value $|Y(n_1,n_2,t)|_{max}$, wherein the analyzer obtains an amplitude for an arriving wavefront by dividing $|Y(n_1,n_2,t)|_{max}$ by a product of a number of sets of pilot data in the series and a number of antennas in the antenna array.

12. (CANCELLED)
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18. (Currently Amended) The method of claim ~~17~~23, wherein the time of arrival and the channel coefficient are essentially concurrently determined by the joint searcher and channel estimator.

19. (Currently Amended) The method of claim ~~17~~23, further comprising applying the channel coefficient and time of arrival to a detector to obtain a symbol estimate.

20. (Currently Amended) The method of claim ~~17~~23, wherein the step of concurrently using the plural signals for determining both the time of arrival and the channel coefficient is performed by a joint searcher and channel estimator situated in a mobile terminal.

21. (Currently Amended) The method of claim ~~17~~23, wherein the step of concurrently using the plural signals for determining both the time of arrival and the channel coefficient is performed by a joint searcher and channel estimator situated in a network node.

22. (CANCELLED)

23. (Currently Amended) A method of operating a wireless communication receiver comprising:

obtaining from plural antennas respective plural series of signals for successive sets of pilot data;

concurrently using the plural series of signals for determining both a time of arrival and channel coefficient;

~~The method of claim 22,~~

wherein each of the plural antennas in the antenna array is represented by an antenna index, wherein each of the sets of pilot data is represented by a pilot set index, wherein the step of concurrently using the plural signals for determining both the time of arrival and the channel coefficient is performed by a joint searcher and channel estimator, and further comprising the joint searcher and channel estimator:

storing a complex value indicative of the signal received in a sampling window an antenna signal matrix as a function of a sampling window time index, the antenna index, and the pilot set index;

performing a Fast Fourier Transformation (FFT) calculation to generate a correlator output;

wherein in performing the calculation the correlator considers plural possible frequencies of complex values along the antenna index and plural possible frequencies of complex values along the pilot set index, plural possible frequencies of complex values along the antenna index corresponding to plural possible directions of arrival and being represented by a frequency index n_1, the plural possible frequencies of complex values along the antenna index corresponding to plural possible doppler shifts and being represented by a frequency index n_2, and wherein for each combination of plural possible direction of arrival frequencies, plural possible doppler frequencies, and plural time indexes; and wherein the correlator calculates:

$Y(n_1,n_2,t) = FFT(n_1,n_2,X(:,:,t))$

wherein t is the sampling window time index; X(:,:,t) is the complex antenna matrix (with the colons ":,:," representing all antenna indexes and all pilot indexes for one sampling window time index).

24. (Original) The method of claim 23, wherein for each combination of plural possible frequencies and plural time indexes, the method comprises evaluating the following expression:

$Y(n,t) = \Sigma C_j *FFT(n,X(:,:,t)), j = 1,K$

wherein C_j is a coding sequence symbol value j and K is the length of the coding sequence.

25. (Original) The method of claim 23, wherein the correlator output comprises $Y(n_1,n_2,t)$, and further comprising determining a maximum absolute value $|Y(n_1,n_2,t)|_{max}$.

26. (Original) The method of claim 25, further comprising:

using a sampling window time index t_max at which $|Y(n_1,n_2,t)|_{max}$ occurs to determine the time of arrival of an arriving wavefront;

using an antenna index n_1_max at which $|Y(n_1,n_2,t)|_{max}$ occurs to determine the direction of arrival of an arriving wavefront; and

using the doppler frequency index n_2_max at which $|Y(n_1,n_2,t)|_{max}$ to determine the doppler shift direction.

27. (Original) The method of claim 25, further comprising obtaining an amplitude for the arriving wavefront by dividing $|Y(n_1,n_2,t)|_{max}$ by a product of a number of sets of pilot data in the series and a number of antennas in the antenna array.

28. (CANCELLED)
29. (CANCELLED)
30. (CANCELLED)
31. (CANCELLED)
32. (CANCELLED)